II. Remarks

Reconsideration and allowance of the subject application are respectfully requested.

Claims 1-2, 5-8, 11-18, and 21 are pending in the application. Claims 1, 8, and 13 are independent.

Applicants have added new dependent Claim 21 to afford themselves a scope of protection commensurate with the disclosure. The new claim is fully supported in the specification (see page 2, line 60 of the specification), and is believed to be allowable for the reasons to be developed below.

Claims 1-2, 5-8, and 11-18 were finally rejected as being unpatentable over Melocco and Wedell, for the reasons detailed at pages 2-7 of the Office Action. Applicants respectfully traverse all art rejections.

Briefly, Melocco fails to disclose or suggest that the returning bush has an internal bellows diameter which varies regularly in the longitudinal direction, as is asserted at the top of page 3 of the Office Action. Figs 2 and 3 of Melocco clearly show that the internal bellows diameter does not vary--it is smooth. Also, Wedell fails to disclose or suggest at least one end segment comprising two narrowings and one swelling, the maximum internal diameter of that end segment

being less than the maximum internal diameter of non-end segments of the returning bush (e.g., in the Fig. 5 embodiment, D4 is less than D2), said at least one end segment having a maximum wall thickness which is greater than maximum wall thicknesses of the non-end segments. Wedell simply does not disclose an end segment having two narrowings and one swelling wherein the *maximum* internal diameter of such end segment is less than the *maximum* internal diameter of non end segments. If the Examiner maintains this rejection, he is respectfully requested to demonstrate on the record precisely where Wedell discloses these claimed features.

Applicants further arguments will be submitted in greater detail, as follows.

Please find enclosed Table 1, which, in a concise way, illustrates some of the differences between the solution of the subject Łagodziński application and the cited art, especially Melocco and Wedell. The differences have been described on the basis of the claims and the description of the structure and its functions.

The returning bush material employed by Łagodziński is elastic (elastomeric in Claims 8, 11-18, and 21), while Melocco employs a foamed material of cellular structure with empty inner

spaces; and Wedell employs a material with a resistance of 39 GPa, i.e. metal, glass or plastic.

The shape of the returning bush also varies in the quoted solutions: in Łagodziński's it is an internal and external bellows diameter which varies regularly in a longitudinal direction with a specified contour. In Melocco, the bush has a constant internal diameter and a circumferential groove on its external diameter. In Wedell, the shape is a ring with a half-wave or U-shaped cross section.

Another major difference concerns the contour of the endings of the returning bush end segments. In Łagodziński's solution (claim 5) it is a specifically described shape with a marked curvature center (geometric locus of the curvature points), which clearly and uniquely specifies the contour of the endings, which determines the functioning of said returning bush. Melocco fails to describe the endings or specify their contour. Wedell proposes a totally different contour of the endings - a ring with a flat end face.

Yet another difference relates to the thickness of the walls of the segments and the phenomenon of initial tension. In Łagodziński's solution (claim 3 and 4, and the patent description) these are specified since they determine the

correct work of the element. In Melocco, the walls of end segments are not thickened and there is no initial tension. Wedell also lacks initial tension, and the wall thickness is substantially constant throughout the whole cross section of the returning bush element. All the above-mentioned matters are subject to detailed analysis in the latter part of this discussion, and the considerable differences and their influence of the performance of the tools are enumerated.

The Applicants respectfully submit that the record does not establish sufficient motivation to combine Melocco with Wedell or other quoted patents. The law is clear that a *prima facie* case of obviousness can be established only by showing some objective teaching in the cited art which would lead an individual of ordinary skill in this art to combine the relevant references. Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined only if there is some suggestion or incentive to do so. The mere fact that the prior art may be modified does not make the modification obvious unless the prior art suggested the desirability of the modification. It is impermissible to use the

claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious.

Taking into consideration the above arguments and 35 U.S.C. § 103, the salient claimed features of the subject application are not merely a combination of previous solutions. The differences set forth in the claims, when referred to the prior art techniques, provide a totally new device (not known or used before, prepared especially for Łagodziński's solution), and result in a device with a different, absolutely reliable way of functioning. The solution according to the present invention may be employed repeatedly, but without the necessity to change the returning bush. The application of the change in the solution according to the invention on the date of applying for the exclusive right were by no means obvious for an individual of ordinary skill in this art.

A comparison of the present claims with the cited art indicates differences present in Łagodziński's application which are not simple and obvious modifications of the known art.

All the solutions incorporated in the claims in the subject application follow from a thorough technical knowledge and a large experience in the area of fastening technology, as

well as a number of tests, experiments, and observations carried out throughout the years of work to obtain the optimum form of the returning bush, which ensure it being absolutely dependable and economical to produce. None of the above-mentioned prior art can be directly applied in the place of the claimed returning bush, and the differences in the subject claims are by no means obvious and would exceed the skills of an individual of ordinary knowledge in this art.

It seems worth to mention that Łagodziński's solution is, at present, the only one employed in the technique of direct assembling and is positively received by the users. Tools comprising said returning bush are sold all over the world and their users praise their dependability, simple construction, easy maintenance, and long life. The suggested solution is simple to manufacture, cheap, and effective in use.

Thus, Applicants are positive that their solution meets all the requirements for the grant of a patent. Applicants respectfully ask the Examiner to study the following explanation and grant them a patent for the solution which is the subject of the application.

To better display certain features of the above-described differences between the claimed invention and the

cited art, Applicants enclose 2 drawings:

Sketch 101 - illustrating said returning bush with the geometric locus of the curvature points (curvature center); and

Sketch 102 - illustrating the movement of the geometric locus of the curvature points (curvature center) during the working stroke of the piston, which might help understand the idea and the work of the suggested solution.

Melocco

One may easily name several differences between the claimed returning bush and the deformable member described in Melocco. Applicants believe that these differences determine the non-obviousness of their solution in view of Melocco.

- **The deformable member** of Melocco has a **substantially closed cellular structure**. Under the influence of the working stroke of the piston, the volume of separate empty spaces is reduced and the whole bush is compressed. The described shape is **an internally cylindrical bush which is empty inside and has circumferential external grooves**. In the description, Melocco teaches away from an elastomeric returning bush

by stressing that manufacturing a bush with a homogeneous rubber would result in a considerable increase of the weight and overall dimensions of the tool. In Applicants' solution they have introduced and claimed a different shape of the returning bush, which results in a substantially different character of the work of said bush. As it has been described in the subject application, the hinged folding of the bellows-like bush takes place under the influence of the axial force until the length of said bush approximates the thickness of the walls of the returning bush, forming a homogeneous element and then compression of the formed homogeneous element is observed. Thus, the application of a different material and a different shape of the bush in both solutions implicates a different character of their work.

• Moreover, Melocco's solution **fails to disclose the phenomenon of the initial tension of the bush**, which due to the large flexibility of the foamed materials may lead to the problem of not returning the piston to the firing position when fastening various elements.

However, even if the initial tension was to be introduced in Melocco's solution, it still would not solve the problem, as the forces following the reduction of the volume of the empty spaces would not be sufficient to hold the massive piston in the intended position. Thus, the subject application employ a bush with a properly selected shape, thickness of the walls and endings, where the forces resulting from the initial tension of the bellows-like bush are large enough to guarantee the return of the piston and keeping it in the firing position.

- Additionally, **neither the shape nor the contour of the bush ending has been specified** in Melocco. Thus, use of the Melocco bush may lead to problems connected with the curling of the returning bush on the piston and the blocking of the tool.

Wedell

The spring described in Wedell:

- **has endings which take the shape of a rigid axial**

annular projection.

• The spring is made of **a very rigid material having a Young's modulus of at least 39 GPa, such as metal, glass or plastic**. It is impossible to employ such a material to return the piston in a piston tool. However, even if one used such a spring made of a rubber material, they would face problems related to the improper forming of the endings of the returning bush.

• **The end segments disclosed by Wedell have an annular axial cross-section** spreading between the internal and external diameters of the wave crest, such that the neutral surface of the spring passes through the said end segments, would bring about, according to Applicants' research, curling of the spring on the piston resulting in its blocking. Thus, it is necessary to employ the endings of the returning bush in the shape specified in the subject claims.

The flexibility of Wedell's spring results from a

large Young modulus of the material it is made of and substantially thin walls of the spring when compared to its diameter. It seems impossible to modify the Wedell with Melocco, since the foam material used in Melocco (because of its flexibility and characteristic features) would be unable to generate an adequately large enough force to return the piston.

Non-obviousness in view of Melocco and Wedell

On the grounds of the above mentioned analysis, Applicants are positive that the subject claims are not subject to § 35 U.S.C. 103 (a) since, to **an individual of ordinary skill in this art, the differences between the subject claims and the disclosures of Melocco and Wedell cannot possibly be obvious**, as they result from years of research and tests, carried out in cooperation with specialized R and D centers, and based on Applicants' own experience collected while using the product as well as thorough engineering and mathematical knowledge.

- **A material totally different** from that in Melocco and Wedell was used in the production of the claimed returning bush, and its composition and the method of manufacturing are the results of innumerable resistance tests.

• Also, **the shape of the claimed bush varies** from the cited art and relates to the optimization of **the thickness of the returning bush walls**, its **internal and external contour, and its endings**. Each of the claimed solutions followed the problems observed during the experimental operation. **The shape and the course of the end segments curvature** leads to the elimination of the problem connected with the curling of the return bushing endings and the blocking of the piston. The appropriate **bellows-like shape** is meant to ensure the maximum axial working stroke of the piston while preserving the smallest possible length of the piston. The external contour of the return bushing **in the shape of the truncated stacks** is to eliminate the phenomenon of friction between the return bushing and the internal surface of the barrel, which led to rubbing through the piston and its premature damage. The gentler rounding of the returning bush segments, and their smaller external diameter also contribute to the fact that one does not observe friction in the area. The increased rigidity of the bush is obtained through **the thickening**

of the end segment walls. Also, **the selected length of the returning bush** for ensuring the optimum strength of the initial tension resulted from the tests.

Białobrzeski

Białobrzeski's U.S. Patent No. 4,235,427 discloses

- **a spring element** comprising a bush made of a **plastic material** with external and internal convulsions having a variable wall thickness.

- According to Białobrzeski, such an element is formed by **injection molding** and later compressed to obtain a permanent initial longitudinal deformation. Obtaining a permanent initial longitudinal deformation in the returning bush according to the subject application is very difficult due to the features of the employed rubber compound. Forming such a deformation in said bush would be disadvantageous due to its shortening, and as a result, not performing the function of returning the piston to the firing position. Moreover, Applicants know from experience that a returning bush

made of plastic would be unable to carry huge dynamic stresses which are created during fastening. The elastomeric compound according to the present invention (for example, on the basis of caoutchouc) provides satisfactory resistance results of the returning bush (the number of fixed elements without any damage), while maintaining the low-cost production.

• In Białobrzeski's bush **the wall thickness in one bead is not constant**, and folding of the bush occurs in the parts having thinner walls.

• Yet another difference between the claimed invention and Białobrzeski is in the endings of said bush. Białobrzeski allows for **a closed ending**, which would make placing any movable element, and especially a piston, inside of the bush impossible.

• Białobrzeski **fails to specify the shape of the bush endings**, and their inappropriate formation leads to the above-described problems related to the curling of the returning bush on the piston and blocking the tool.

Said end segments curvatures employed in Applicants' solution (Claim 5), resulting from numerous simulations and calculations, eliminate the problem and guarantee a failure-free work of the returning bush-piston assembly.

On the basis of the above mentioned differences, Applicants unequivocally conclude that employing a spring as proposed by Białobrzeski to return the piston in a powder actuated tool is not practical, and the differences between that spring and Applicants' returning bush are not obvious for an individual of ordinary skill in this art.

Snelling

Snelling's U.S. Patent No. 3,301,335 discloses an energy absorbing **construction made of foamed plastic material**. This construction is close to Melocco in that it has similar faults and problems resulting from employing material of **cellular structure**. This construction also has circumferential grooves with various prismatic contours. However, **the thickness and shape of the end segments which are not defined** as well as **the lack of the initial tension** results in problems already analyzed above in the example of Melocco, which cannot be solved

in an obvious way.

Antkowiak

U.S. Patent No. 4,591,030 to Antkowiak discloses an elongated elastomeric element having **an undulating shape**. The fault of that solution is a relatively **small axial compressibility** of the elastomeric element which would cause the necessity to considerably increase the overall dimensions of the tool so as to obtain the necessary working stroke of the piston. In Applicants solution, the problem has been solved by the appropriate selection of the external and internal shape of the returning bush and the wall thickness. Since the diameter of the elastomeric element in Antkowiak corresponds to the size of the internal diameter of the chamber in which it is located, one has to allow for **the friction between the external diameter of the elastomer and the chamber**, which results in rubbing through the elastomer and its premature damage. This problem may be solved by the appropriate selection of the external diameter of the returning bush and the internal diameter of the barrel, preserving an adequate force for returning the piston. Such a construction of the returning bush requires a thorough knowledge of materials technology, materials resistance, physics, and

carrying out numerous resistance tests of the given models. As a result of Applicants' research, the claimed shape of the returning bush, its wall thickness, and diameter-relations have been obtained.

Veglia

In U.S. Patent No. 4,618,130 to Veglia there is disclosed **a resilient block**, comprising **an elastomeric bush connecting the constituent elements**. This bush, not only due to its **different application** (connecting elements and not dynamic returning of a movable element), but also because of its shape and construction does not provide any premise for applying and using it in powder actuated tools for fixing elements.

Pflister et al.

In addition to the patents cited by the Examiner, Applicants would like to call attention to U.S. Patent No. 6,059,163 to Pflister. It discloses:

- the return member being formed as a hollow cylindrical element of an elastic material having a plurality of openings on the external and internal side

of the element. The shape is similar to described by, e.g., Wedell, Jarret, and Scowen. Similar to Białobrzeski, Pflister allows for these **cavities to run along a helical line**. **Associating the return element with a spring** is a solution earlier disclosed by, among others, Veglia.

• The returning bush suggested by Pflister is made of **an unspecified elastic material**, which may lead to a number of problems described above, i.e. **too small returning force, fast wear, lack of heat resistance**. Only by employing a highly resistant material of large flexibility and heat resistance may one guarantee the correct performance of the tool and provide a sufficient life of the returning bush.

• The return element in Pflister **is not subject to initial tension**, which, if one uses an elastic material, may lead to the problem of not returning the piston to the firing position (thoroughly described above).

- Another fault of the Pflister solution is **the lack of specified endings of the return element**, which may result in the above-described phenomenon of curling the returning bush on the piston. While working on Applicants' solution Applicants encountered this problem, which was alleviated by introducing appropriately located and formed curvatures of the endings of the returning bush end segments. Obtaining said form of the curvatures followed a number of tests.

Conclusion

The claims of the Łagodziński application are novel and non-obviousness when compared to the cited art for at least the following reasons:

- **the material** used in the manufacturing of the returning bush described as elastic, elastomeric, since only this material may withstand huge dynamic and thermic loads, keeping the right rates of elasticity and tear resistance. This compound has been obtained by research, tests, and consultation with the producer who provides our company with the compound especially

prepared to meet our needs.

• **the length of the returning bush** before it is placed on the piston which results in **the phenomenon of initial tension of the returning bush** in its initial position. This tension ensures the full return of the piston to the firing position after each shot and, moreover, the piston remains in that position until the next powder charge is fired.

• **the shape of the end segments of the bush**, i.e. **a curvature in the external direction where the place of the geometric locus of the curvature points is considerably distanced from the face of the bush**. Such a form of the return element endings ensures a fluent work of the tool, without any wrapping of the piston by the returning bush, which would result in the blocking of the tool. Obtaining such a construction of the end segments of the returning bush follows from the problems encountered during test. It required numerous calculations, simulations, as well as tests conducted by the producer and in scientific development centers

to solve these problematic issues.

• **the proportion between the external diameter of the returning bush and the internal barrel and the contour of the external shape of the returning bush as a truncated stack**, which does not cause any friction between the returning bush and the barrel or the damage of the returning bush. The optimum ratio of the diameters while keeping the right internal contour also arises from a number of resistance and fatigue tests of the returning bush.

All of the solutions incorporated in the claims in the subject application follow from a thorough technical knowledge and extensive experience in the area of fastening technology, as well as a number of tests, experiments and observations carried out throughout years of work to obtain the optimum form of the returning bush, which would ensure being absolutely dependable and economical to produce. None of the above-mentioned art can be directly applied in the place of Applicants returning bush, and introducing the structural differences in the subject claims is by no means obvious and exceeds the skills of an individual

of ordinary knowledge in this art.

It is worthwhile to mention that Applicants' solution is, at present, the only one employed in the technique of direct assembling and is positively received by the users. Tools having the claimed returning bush are sold all over the world and their users praise their dependability, simple construction, easy maintenance and long life. The claimed solution is simple to manufacture, cheap and effective in use.

Thus, Applicants are positive that their solution meets all of the requirements for patentability. Applicants respectfully ask the Examiner to study the above explanation and to grant Applicants a patent for the solution which is the subject of the application.

In view of the above amendments and remarks, it is believed that this application is now in condition for allowance, and a Notice thereof is respectfully requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 625-3507. All

correspondence should continue to be directed to our address given below.

Respectfully submitted,

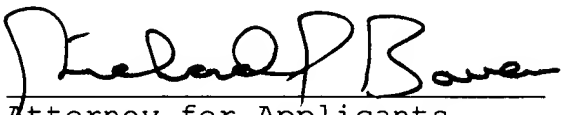

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TABLE 1

		ŁAGODZIŃSKI	MELOCCO	WEDELL	BIALOBRZESKI	SNELLING	ANTKOWIAK	VEGLIA	PFLISTER
1	APPLICATION IN DIRECT ASSEMBLY TECHNIQUES	YES	YES	NO	NO	YES	NO	NO	YES
2	APPLICATION OF A BARREL ASSEMBLY WITH A PISTON	YES	YES	NO	NO	YES	YES	NO	YES
3	MATERIAL OF THE ELEMENT (DESCRIBED IN CLAIM 1 AND 21 BY ŁAGODZIŃSKI)	ELASTIC, ELASTOMERIC	POLYURETHANE OF CLOSED CELLULAR STRUCTURE WITH INNER EMPTY PORES - FOAMED	MATERIAL HAVING A YOUNG'S MODULUS OF ELASTICITY OF AT LEAST 39 GPA, i.e. METAL, GLASS, PLASTIC	PLASTIC MATERIAL (ACETAL)	FOAMED PLASTIC MATERIAL	ELASTOMER (NEOPRENE, SILICON RUBBER)	ELASTOMERIC	ELASTIC MATERIAL (NOT SPECIFIED CLOSELY)
4	SHAPE OF THE ELEMENT (DESCRIBED IN CLAIM 1 AND 2 BY ŁAGODZIŃSKI)	EXTERNAL AND INTERNAL BELLOWS DIAMETER WHICH VARIES REGULARLY IN LONGITUDINAL DIRECTION WITH A CONTOUR OF A STACK OF FRUSTA-SPHERICAL, FRUSTA-CONICAL, BARREL-SHAPED OR SINUSOIDAL SEGMENTS	DEFORMABLE MEMBER WITH AT LEAST ONE CIRCUMFERENTILA GROOVE ON ITS EXTERNAL DIAMETER, THE INTERNAL DIAMETER IS CONSTANT	A TUBE OR RING MADE UP OF AT LEAST TWO OPPOSITELY DIRECTED SPRING PARTS OF HALF-WAVE OR "U"-SHAPED CROSS SECTION	INNER AND OUTER CONVULTIONS ALONG THE LONGITUDINAL AXIS HAVING INNER VALLEYS AND OUTER RIDGES	GENERALLY PRISMATIC EXTERNAL CONTOUR	UNDULATING SHAPE	NOT SPECIFIED	A HOLLOW CYLINDRICAL STRUCTURAL MEMBER HAVING A PLURALITY OF CIRCUMFERENTIAL OPENINGS IN A LONGITUDINAL DIRECTION, ALTERNATIVELY ON AN INNER AND OUTER SIDE OF THE MEMBER (THE CIRCUMEFERENTIAL OPENINGS CAN EXTEND ALONG A HELICAL LINE)
5	DEFINITION OF THE ELEMENT ENDINGS (DESCRIBED IN CLAIM 5 BY ŁAGODZIŃSKI)	GEOMETRIC LOCUS OF THE CURVATURE POINTS (CENTER OF CURVATURE) IS CONSIDERABLY DISTANCED FROM THE END FACE OF THE BUSH, AND THE INNER END SURFACE OF END SEGMENTS IS SHARPLY OUTWARDLY CURVED (FIG. 101)	NOT SPECIFIED	ENDINGS COMPRISING A RING WITH A FLAT END FACE	THEY MAY BE CLOSED	ENDINGS IN A FORM OF INCOMPRESSIBLE ELEMENTS	NOT SPECIFIED	CYLINDRICAL ENDINGS ARE VULCANIZED TO OTHER ELEMENTS OF THE RESILIENT BLOCK	NOT SPECIFIED
6	THICKENING OF THE ELEMENT ENDINGS (DESCRIBED IN CLAIM 1 BY ŁAGODZIŃSKI)	AT LEAST ONE END SEGMENT IS THICKER THAN NON-END SEGMENTS	NOT SPECIFIED	SUBSTANTIALLY CONSTANT WALL THICKNESS	NO, THE CHANGE OF WALL THICKENESS IN THE WHOLE ELEMENT	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED
7	STATING THE PROPORTION BETWEEN THE ELEMENT DIAMETER AND THE BARREL DIAMETER (DESCRIBED IN CLAIM 7 BY ŁAGODZIŃSKI)	YES, THE EXTERNAL DIAMETER OF THE ELEMET IS SMALLER THAN THE INTERNAL DIAMETER OF THE BARREL IN THE FASTENING POSITION (NO FRICTION BETWEEN THE ELEMENT AND THE BARREL - DAMAGE)	YES, BUT THE EXTERNAL DIAMETER OF THE ELEMENT IS SMALLER THAN THE INTERNAL DIAMETER OF THE BARREL IN THE INITIAL POSITION (FRICTION BETWEEN THE ELEMENT AND THE BARREL - QUICK DAMAGE)	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	YES, THE INTERNAL DIAMETER OF THE BARREL IS GREATER THAN THE EXTERNAL DIAMETER OF THE ELEMENT	NOT SPECIFIED	NOT SPECIFIED
8	INITIAL TENSION OF THE ELEMENT (DESCRIBED IN PATENT DESCRIPTION BY ŁAGODZIŃSKI)	YES, DUE TO THE DIFFERENCE BETWEEN THE LENGTH OF THE RETURNING BUSH AND THE DISTANCE BETWEEN THE SURFACE OF THE PISTON HEAD (FROM THE RETURNING BUSH SIDE) AND THE THE SURFACE OF THE FASTENER GUIDE (FROM THE RETURNING BUSH SIDE)	NOT PRESENT	NOT PRESENT	YES, BUT CREATED DURING THE MANUFACTURING PROCESS	NOT PRESENT	NOT PRESENT	NOT PRESENT	NOT PRESENT

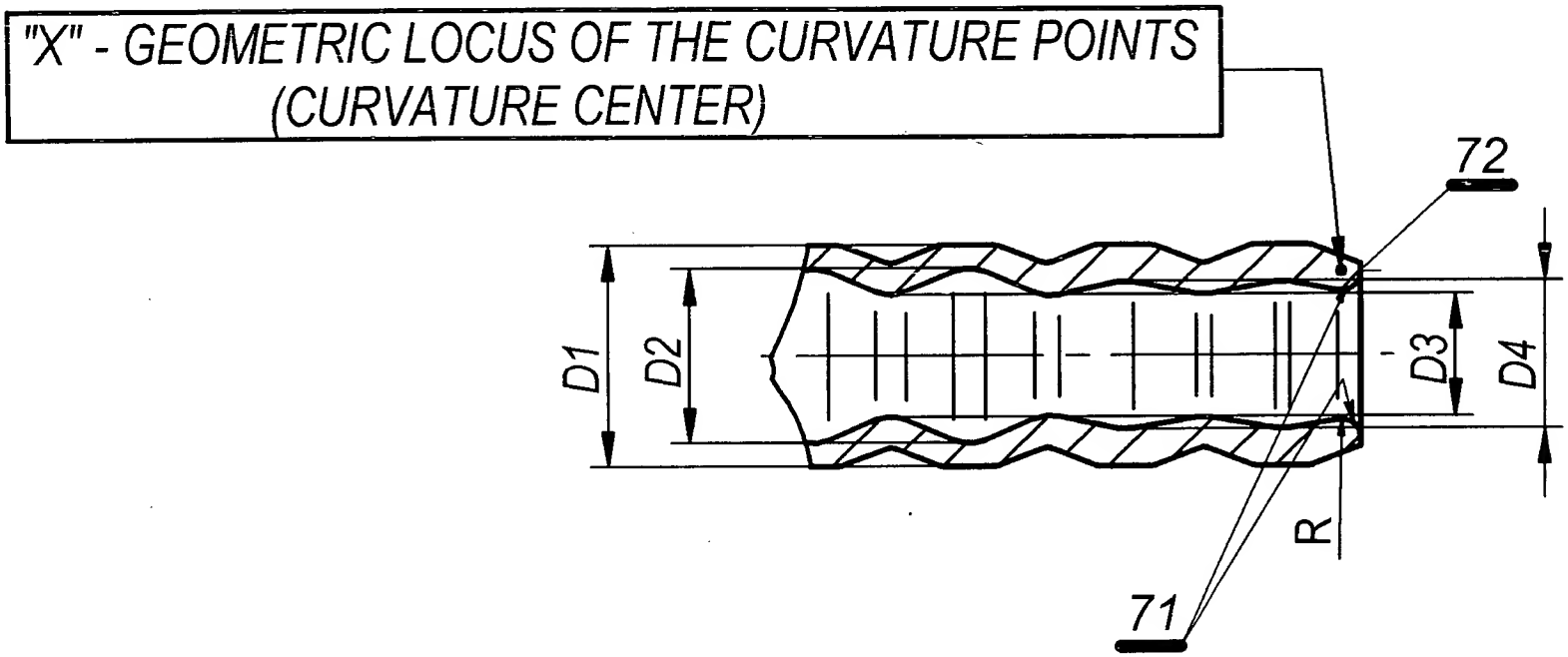
"X" - GEOMETRIC LOCUS OF THE CURVATURE POINTS
(CURVATURE CENTER)
72
D1
D2
D3
D4
R
71

Fig.101

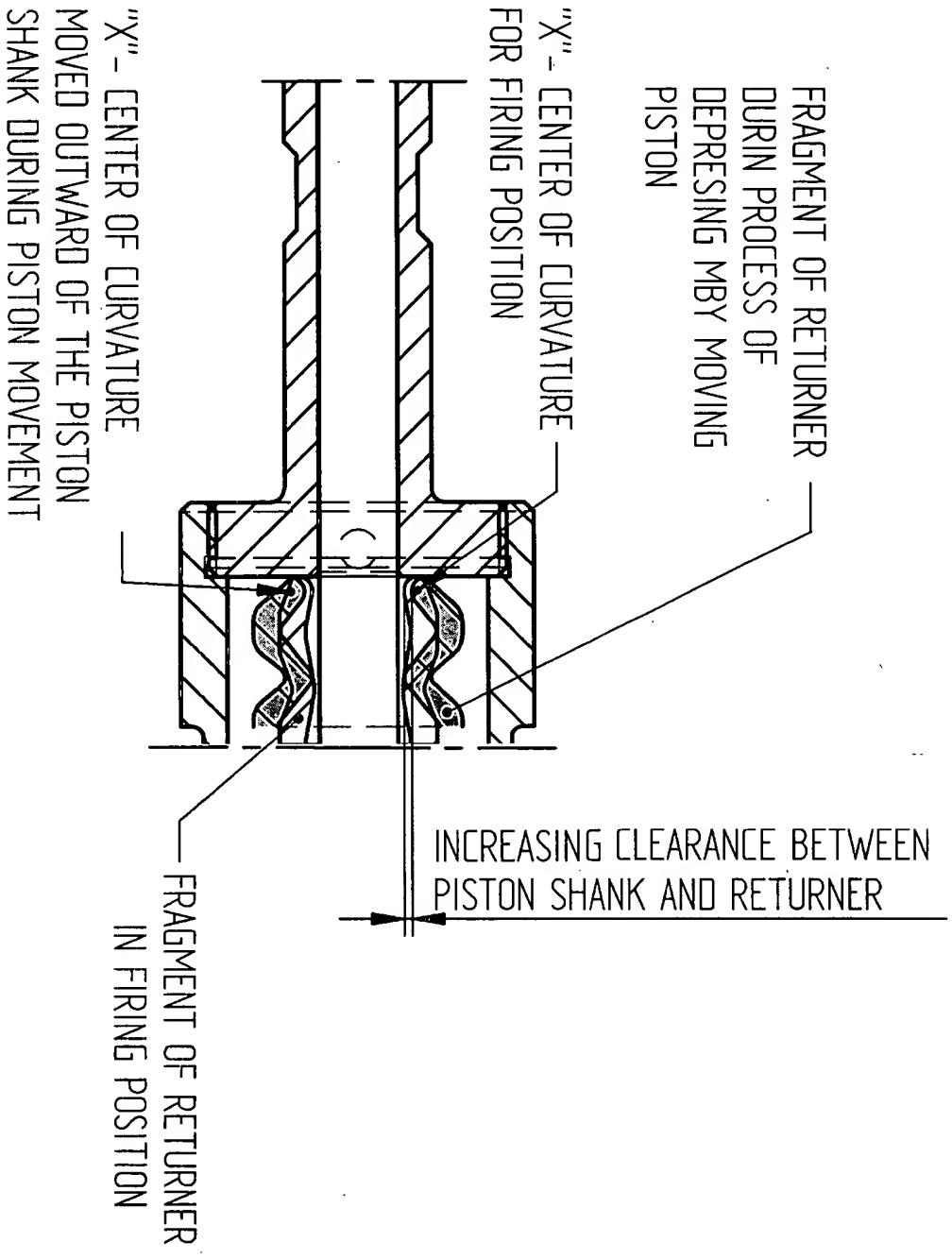
FRAGMENT OF RETURNER
DURIN PROCESS OF
DEPRESING MBY MOVING
PISTON
"X"- CENTER OF CURVATURE
FOR FIRING POSITION
"X"- CENTER OF CURVATURE
MOVED OUTWARD OF THE PISTON
SHANK DURING PISTON MOVEMENT
INCREASING CLEARANCE BETWEEN
PISTON SHANK AND RETURNER
FRAGMENT OF RETURNER
IN FIRING POSITION

Fig. 102